REMARKS

Claims 50-53, 55-63, and 65-71 are pending. Reconsideration of the July 30, 2003 Official Action is respectfully requested.

1. Rejection of Claims 50-53, 55-58, 60-62, and 65-71 under 35 U.S.C. §103

Claims 50-53, 55-58, 60-62 and 65-71 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,522,934 ("Suzuki"). The reasons for the rejection are stated in numbered section 2, at pages 2-5 of the Official Action. The rejection is respectfully traversed.

Claim 50 recites an inductively coupled plasma processing system, which comprises "a plasma processing chamber; a substrate holder supporting a substrate having a periphery within said processing chamber ...; a process gas distribution system for introducing a process gas into said processing chamber, the process gas distribution system comprising injectors at least some of which direct the process gas along axes that intersect an exposed surface of the substrate at an acute angle, *all of the injectors of the process gas distribution system being spaced outwardly from the periphery of the substrate* ...." (Emphasis added.) Suzuki fails to disclose or suggest the plasma processing system recited in Claim 50.

It is asserted in the Official Action that:

> Suzuki et al. teaches a PECVD ... ICP reactor with a plasma processing chamber ... [and] a process gas distribution system (54, Figure 11; column 10, lines 3-43) for gas introduction into the process chamber .... The process gas distribution system comprising injectors (64B or 56B; Figure 8, 9, 11) with orifice (58B; Figure 9, 11) *at least some of which* direct the process gas along an axis that intersects the substrate at an acute angle, *these same* injectors being spaced outwardly from

> the periphery of the substrate (Figure 8, 11) (emphasis added).

It is acknowledged in the Official Action that "Suzuki does *not* teach that *all* of his injectors, other than outward injectors (64B of 56B; Figure 8, 9, 11), of the process gas distribution system are spaced outwardly from the periphery of the substrate" (emphasis added).

However, it is asserted in the Official Action that:

> [i]t would have been obvious to one of ordinary skill in the art at the time the invention was made *to widen the radial dimension of Suzuki's process gas distribution system* (54, Figure 11; column 10, lines 33-43) thereby providing *all* his injectors of the process gas distribution system being spaced outwardly from the periphery of the substrate. Motivation to widen the radial dimension of Suzuki's process gas distribution system thereby providing all his injectors of the process gas distribution system being spaced outwardly from the periphery of the substrate is *to improve the in-plane uniformity of the deposited film* as taught by Suzuki (Figures 5, 6, 7a-7c; column 6, line 38 - column 7, line 60). Further, it is well established that *changes in apparatus dimensions* are within the level of ordinary skill in the art (emphasis added; citations omitted).

Applicants respectfully disagree with these assertions. Suzuki discloses plasma processing apparatuses that include a gas supply head 54. The apparatus shown in FIG. 8 includes a gas supply path 56A having a process gas injection hole 58A, a process gas supply path 56B having a process gas injection hole 58B, and additive gas supply paths 60 having additive gas injection holes 62 disposed above the process gas injection holes 58A. Regarding the apparatus shown in FIG. 8, Suzuki discloses that:

> [i]n this case, the process gas injection holes 58A at the upper level are closer to the center of the process vessel than the

> process gas injection holes 58B at the lower level. For this reason, the same functional effect as that of the apparatus shown in FIG. 2 can be obtained, and the in-plane uniformity of the thickness of film formation can be improved. *In addition, this embodiment can cope with an increase in diameter of a wafer* (emphasis added; col. 10, lines 4-8).

It is noted that the apparatus shown in FIG. 2 of Suzuki includes process gas injection holes 36A, 36B, 36C; additive gas injection holes 44 above the gas injection holes 36A, 36B; and a wafer W supported on a susceptor 6; however, the process gas injection holes 36A, 36B and the additive gas injection holes 44 are *not* spaced outwardly from the periphery of the wafer W. Suzuki discloses that the apparatus shown in FIG. 2 can improve the in-plane uniformity of the thickness of film formation, and can cope with an increase in wafer diameter. Thus, Suzuki discloses positioning the gas injection holes within the wafer periphery to improve the in-plane uniformity of the thickness of film formation.

Suzuki further discloses that "[w]hen process gas injection holes are arranged at a plurality of levels, and an injection hole located at an upper level is closer to the center of the vessel than an injection hole located at a lower level, the in-plane uniformity of film formation can be improved while keeping a high film formation efficiency" (col. 7, lines 51-57). Such arrangement of the process gas injection holes is shown in FIGs. 2 and 8.

Suzuki fails to disclose or suggest any arrangement of the process gas injection holes that includes *all* gas injection holes spaced *outwardly* from the periphery of a substrate supported on a substrate holder. To the contrary, Suzuki discloses that in-plane uniformity of film formation *is improved* and *at a high film efficiency* in apparatuses that

include most process gas injection holes disposed *inwardly* from the periphery of the substrate, as shown in FIG. 2 and FIG. 8. Accordingly, Suzuki teaches away from the combination of features recited in Claim 50, which includes "all of the injectors of the process gas distribution system being spaced outwardly from the periphery of the substrate." Thus, Suzuki provides no motivation to modify the disclosed apparatus to achieve the combination of features recited in Claim 50. *See, e.g., In re Hedges*, 228 USPQ 685, 687 (Fed. Cir. 1986).

In addition, Suzuki fails to disclose or suggest widening the radial dimensions of the process gas distribution system 54 shown in FIG. 11 so that all of the injectors of the process gas distribution system are spaced *outwardly* from the periphery of the substrate, as asserted in the Official Action. Suzuki discloses that in-plane uniformity of film formation *is improved* and *at a high film efficiency* in apparatuses that include most process gas injection holes disposed *inwardly* from the periphery of the substrate. Suzuki does not suggest that improved film formation could be achieved by modifying the gas distribution system in the manner alleged in the Official Action.

Furthermore, Suzuki discloses that the embodiment shown in FIG. 2 can "cope with an increase in diameter of a wafer" (col. 10, lines 7-8). In other words, Suzuki discloses that the same gas distribution system shown in FIG. 2 can be used with wafers having different diameters. Also, increasing the diameter of the wafer W shown in FIG. 8 would *increase* the amount of overlap of the process gas injection holes and additive gas supply paths relative to the periphery of the wafer. For this additional reason, Suzuki provides no

motivation to modify the apparatus so that each of the process gas injection holes and additive gas supply paths is spaced outward from the periphery of the wafer.

The Official Action cites *In re Rose*, 105 USPQ 237 (CCPA 1955); *Gardner v. TEC Systems, Inc.*, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830; *In re Rinehart*, 189 USPQ 143 (CCPA 1976); and MPEP §2144.04, as allegedly supporting the assertion that it would have been obvious to modify the radial dimensions of Suzuki's gas distribution system so that all of the injectors are spaced outwardly from the periphery of the substrate. Applicants respectfully submit that these cases do not support the rejection, especially in light of Suzuki teaching away from the asserted modification.

First, in *Rose*, the court considered whether the size of a bundle of lumber is a patentable invention. This decision does not support the asserted modification of only specific components of Suzuki's apparatus in order to achieve the claimed invention.

In *Rinehart*, the CCPA considered whether scaling up a prior art process to achieve commercial scale production is patentable. However, the claimed invention is not directed to a process that is scaled up to achieve commercial scale production like in *Rinehart*. Accordingly, it is respectfully submitted that this decision is not relevant to the patentability of the claimed inductively coupled plasma processing system.

Finally, in *Gardner* the Federal Circuit considered whether claimed dimensional limitations patentably distinguished the claimed subject matter over prior art that disclosed the claimed invention except for the dimensional limitations. The court did not state that dimensional limitations cannot provide a basis for patentability of claimed subject matter. Suzuki discloses that in-plane uniformity of film formation *is improved* and *at a high film*

efficiency in apparatuses that include process gas injection holes that are mostly disposed *inwardly* from the periphery of the substrate. Clearly, Suzuki discloses that the dimensions of the process gas injection holes *do* affect the performance and operation of the gas distribution system. Suzuki teaches away from a gas distribution system in which "all of the injectors of the process gas distribution system being spaced outwardly from the periphery of the substrate," as recited in Claim 50.

Accordingly, because Suzuki does not provide the required motivation to modify the disclosed apparatus to achieve the subject matter recited in Claim 50, Claim 50 is patentable over Suzuki. Dependent Claims 51-53, 55-57, 59-63, and 71 thus also are patentable over Suzuki for at least the same reasons that Claim 50 is patentable.

Independent Claim 58 is directed to an inductively coupled plasma processing system, which comprises *inter alia* "a process gas distribution system which provides process gas into the processing chamber, the process gas distribution system including injectors at least some of which direct the process gas along axes that intersect an exposed surface of the substrate at an acute angle, *all of the injectors of the process gas distribution system being spaced outwardly from the periphery of the substrate*" (emphasis added). The subject matter recited in Claim 58 also is patentable over Suzuki for the reasons discussed above.

Independent Claim 65 is directed to an inductively coupled plasma processing system, which comprises *inter alia* "a gas supply for introducing a process gas into the processing chamber, the gas supply including injectors at least some of which direct the process gas along axes that intersect an exposed surface of the substrate at an acute angle,

all of the injectors of the gas supply being spaced outwardly from the periphery of the substrate" (emphasis added). The subject matter recited in Claim 65 also is patentable over Suzuki for the reasons discussed above. Dependent Claims 66-71 thus also are patentable over Suzuki for at least the same reasons that Claim 65 is patentable.

Withdrawal of the rejection is therefore respectfully requested.

2. Rejection of Claims 59 and 63 under 35 U.S.C. §103

Claims 59 and 63 stand rejected under 35 U.S.C. §103(a) over Suzuki in view of U.S. Patent No. 5,851,294 ("Young").

Claims 59 and 63 depend from Claim 50. It is acknowledged in the Official Action that "Suzuki does not teach that the orifice of his injectors direct the process gas in a upward direction away from the substrate." However, it is asserted in the Official Action that Young teaches this feature, and it is alleged that it would have been obvious "for Suzuki to optimize the angle of his injectors so the process gas is directed in an upward direction away from the substrate as taught by Young."

Without addressing these assertions, Applicants submit that Young also fails to disclose or suggest features recited in Claim 50. Particularly, Young does not disclose or suggest a "process gas distribution system comprising injectors at least some of which direct the process gas along axes that intersect an exposed surface of the substrate at an acute angle, *all of the injectors of the process gas distribution system being spaced outwardly from the periphery of the substrate*" (emphasis added), as recited in Claim 50. Young discloses a gas injection assembly 10 including plenum 42a including nozzles 34a, plenum 42b including nozzles 34b, and plenum 42c including nozzles 34c. The nozzles

34b and 34c are spaced *inwardly* from the periphery of the wafer 22. Young discloses that the nozzles 34a, 34b and 34c can obtain a film having a *substantially uniform thickness* (col. 7, lines 16-19). Accordingly, Young also teaches away from modifying Suzuki to achieve the combination of features recited in Claim 50. The subject matter recited in Claims 59 and 63 is thus also patentable over Suzuki and Young for at least the same reasons that Claim 50 is patentable.

Withdrawal of the rejection is therefore respectfully suggested.

For the foregoing reasons, withdrawal of the rejections and prompt allowance of the application are respectfully requested.

Respectfully submitted,

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